INTERNATIONAL STANDARD

ISO 6481

Second edition
2019-06

Test conditions for vertical surface type broaching machines — Testing of accuracy

Conditions de réception des machines verticales à brocher les extérieurs — Contrôle de l'exactitude

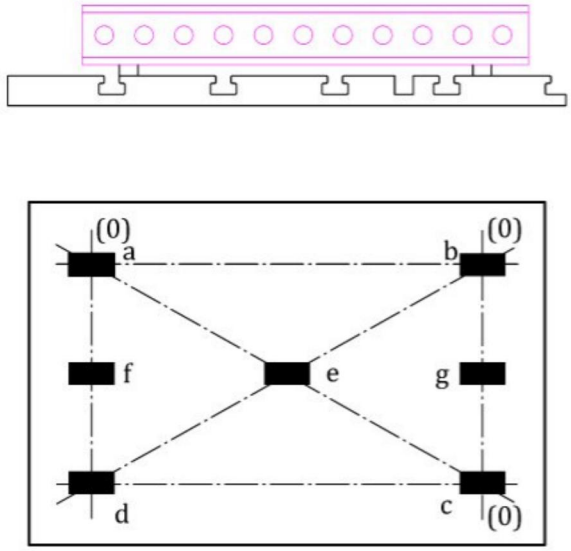
Reference number
ISO 6481:2019(E)

6 Geometric tests

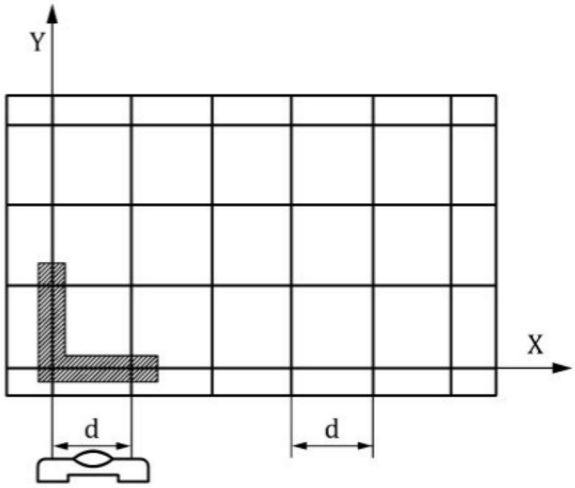
Object	**G1**
Checking of flatness of the table	

Diagram

Method A by straightedge and series of gauge blocks



Method B by precision level



Tolerance

0,040 for a measuring length of up to 1 000

Measured deviation

Measuring instruments

Method A: Straightedge and gauge blocks; or

Method B: precision level or optical instruments.

Observations and references to ISO 230-1:2012, 12.2.3.1, 12.2.4 and 12.2.5

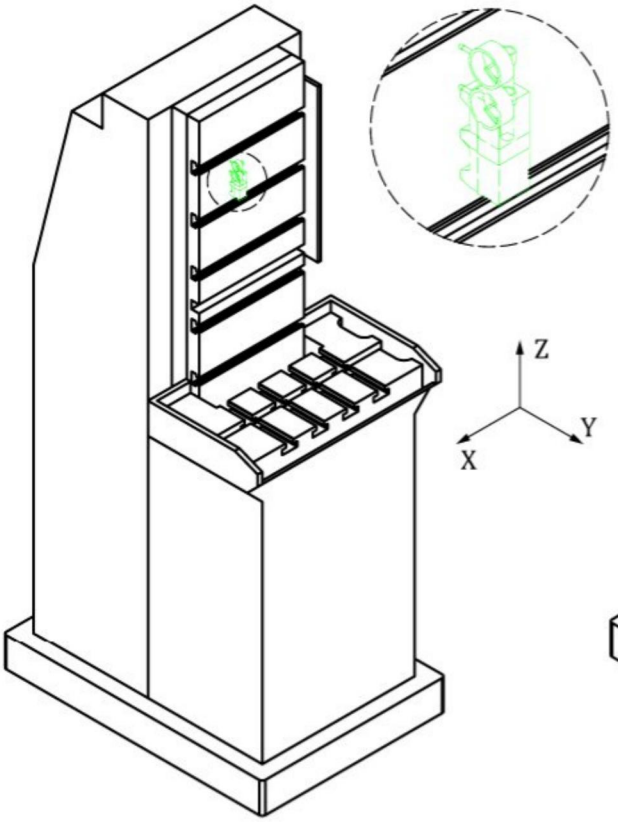
For implementing flatness measurement by straightedge and series of gauge blocks (method A), refer to ISO 230-1:2012, 12.2.3.1.

For implementing the test by precision level or optical instruments (method B), measurements shall be carried out at a number of positions equally spaced with measuring distance, *d*. For more details and interpretation of obtained results, refer to ISO 230-1:2012, 12.2.4 and 12.2.5, for precision level and optical instruments respectively.

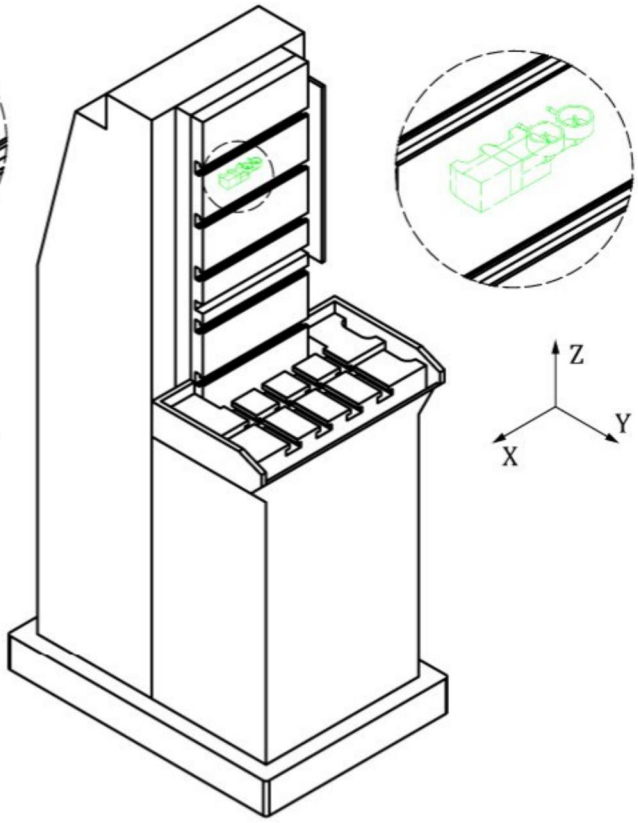
Object	**G2**
Checking of flatness of the surface of broach holder	

Diagram

First step of measurement in vertical direction



Second step of measurement in horizontal direction



Tolerance

0,025 for a measuring length of up to 500

Total tolerance: 0,040

Measured deviation

Measuring instruments

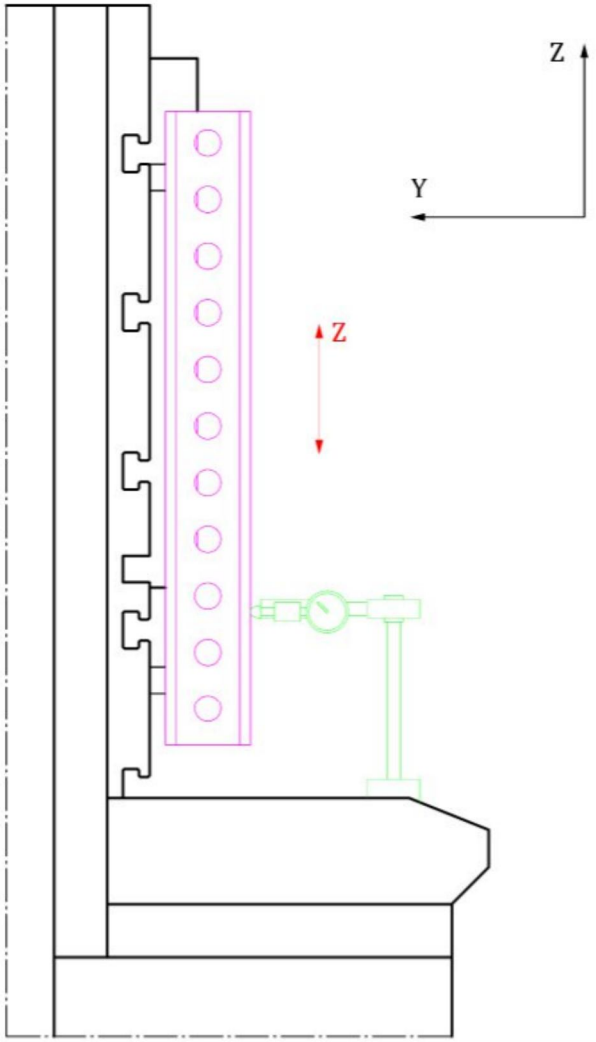
Dial gauge with metrological carriage.

Observations and references to ISO 230-1:2012, 12.1.3.5 and 12.2

In order to determine flatness of the rectangular surface which is a vertical plane, a dial gauge with a special base is used. In the first step, measurements shall be carried out at a number of positions equally spaced in horizontal directions. In the second step, measurements are performed in vertical directions by the same dial gauge with its special base with equally spaced measuring distances. For more details and interpretation of obtained results, refer to ISO 230-1:2012, 12.2.4.

Object	**G3**
Checking of parallelism error of the broach holder movement (Z-axis) to the surface of broach holder	

Diagram



Tolerance

Local tolerance: 0,025 over a measuring length of 1 000

Total tolerance: 0,050

Measured deviation

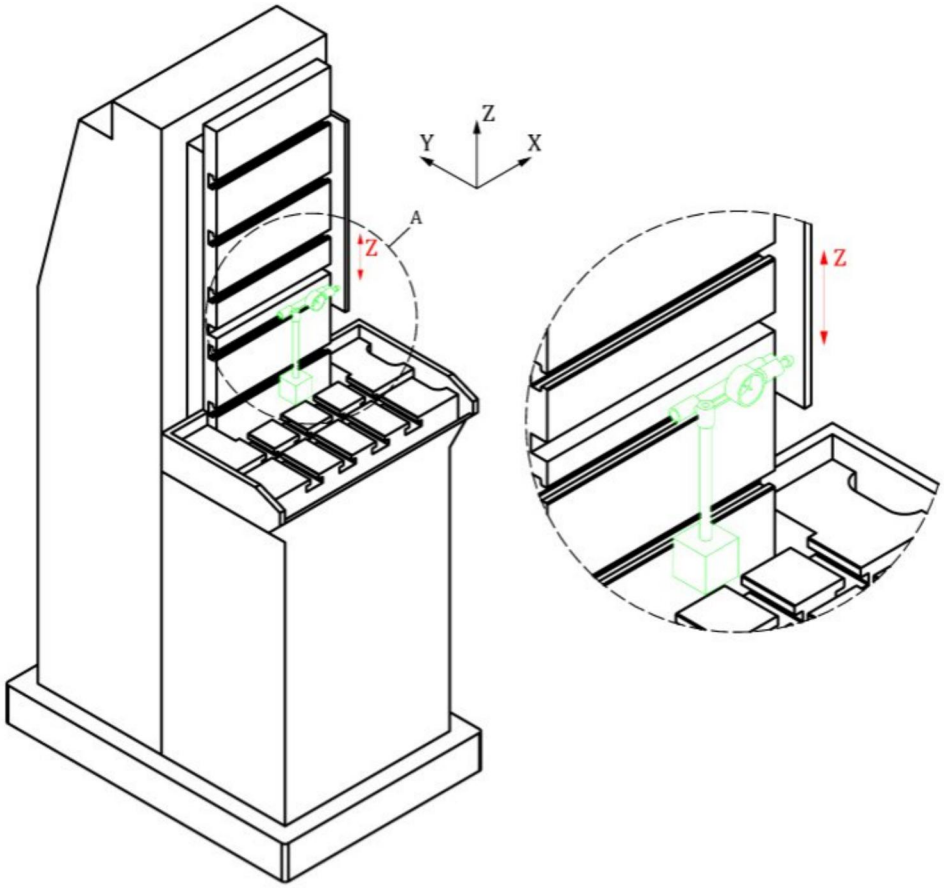
Measuring instruments

Straightedge, gauge blocks and dial gauge.

Observations and references to ISO 230-1:2012, 12.3.2.5.1

Fix the dial gauge base on the table of the machine. By two equal-size gauge blocks, fix the straight-edge on the broach holder. Contact the stylus to the front surface of straightedge. Move the broach holder along Z-axis in front of dial gauge and record the variations of the dial gauge.

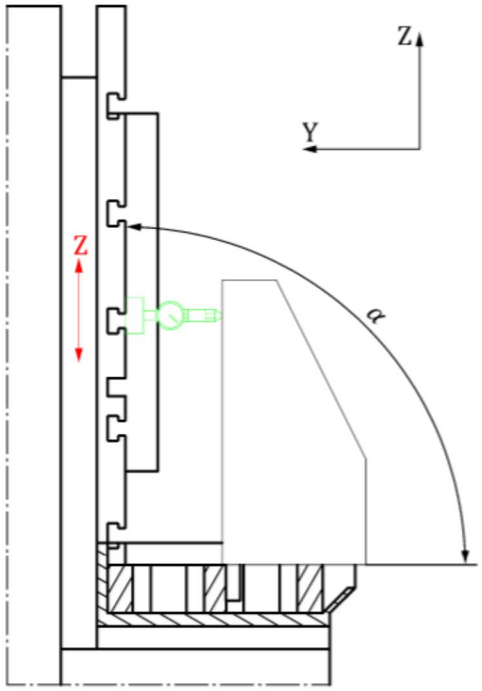
The parallelism error is the difference between the maximum and the minimum readings of the dial gauge.

Object	**G4**
Checking of parallelism of the broach holder movement (Z-axis) to the broach positioner. NOTE This test also applies to machines with a vertical keyway.	
Diagram  	
Tolerance Local tolerance: 0,025 over a measuring length of 1 000 Total tolerance: 0,050	
Measured deviation	
Measuring instruments Dial gauge.	
Observations and references to ISO 230-1:2012, 12.3.2.5.1 Fix the dial gauge base on the table of the machine. Contact the stylus of the dial gauge to the surface of broach positioner in YZ plane. Move broach positioner downward along Z-axis and record the variations of the dial gauge. The parallelism error is the difference between the maximum and minimum readings of the dial gauge.	

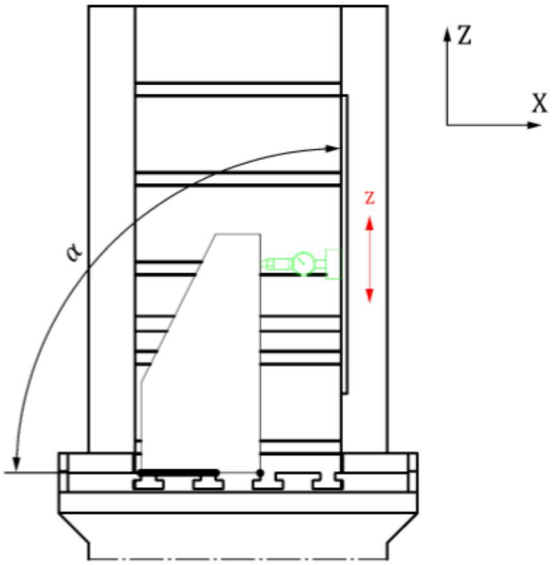
Object	**G5**
Checking of squareness of the broach holder/positioner movement (Z-axis) to the table: a) in the longitudinal direction (along Y direction); b) in the transverse direction (along X direction).	

Diagram

a)



b)

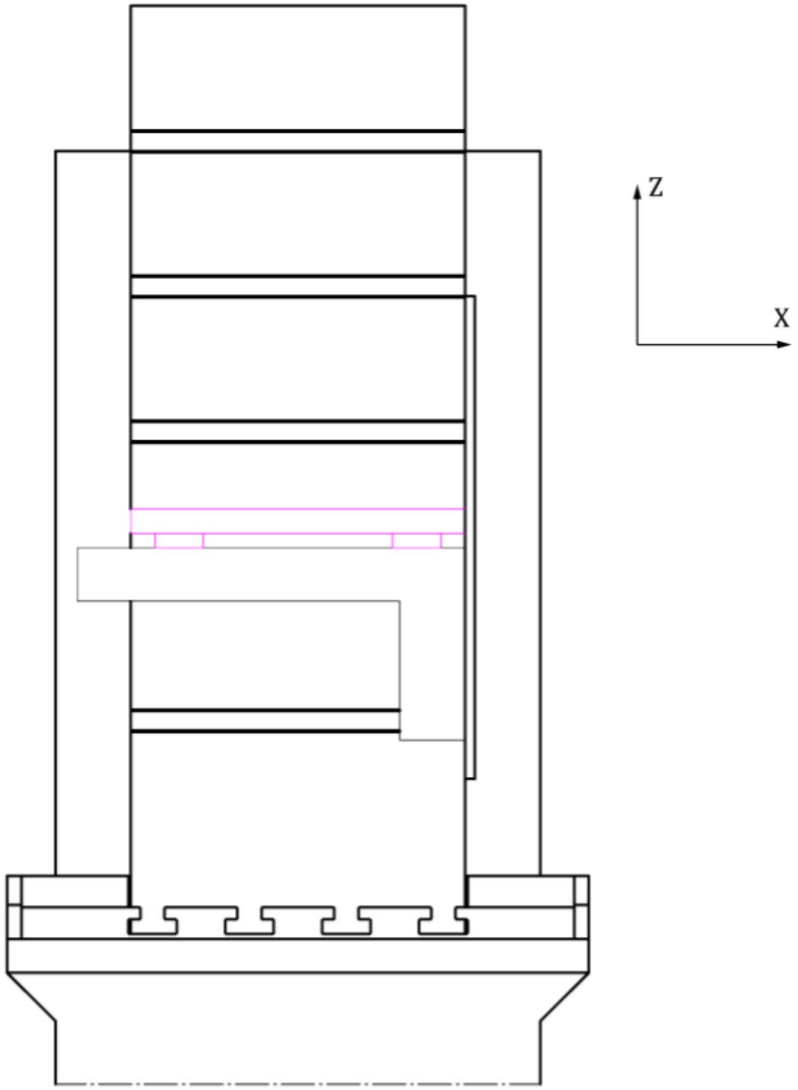


Tolerance

For a and b) 0,040 / 300 (0,135 / 1 000) or 27“

α shall be less than 90°

Measured deviation
a) b)
Measuring instruments
Square and dial gauge.
Observations and references to ISO 230-1:2012, 12.4.5
For a) Fix a square on the table while one measuring side of the square is oriented along Y direction. Set the base of the dial gauge on the broach holder. Fix the dial gauge with its stylus oriented along Y direction touching the square. Move broach holder (Z-axis) with the dial gauge attached along the square. Record the variations of the dial gauge and also the first and the last positions of Z-axis. The squareness error is the difference between the readings at the top and bottom of the square divided by the predetermined stroke of Z-axis at those positions. For b) Fix a square on the table while one measuring side of the square is oriented along X direction. Set the base of the dial gauge on the broach positioner. Fix the dial gauge with its stylus oriented along X direction touching the square. Move broach positioner (Z-axis) with the dial gauge attached along the square. Record the variations of the dial gauge and also the first and the last positions of Z-axis. The squareness error is the difference between the readings at the top and bottom of the square divided by the predetermined stroke of Z-axis at those positions.

Object	**G6**
Checking of squareness of the lower face of the cross tenon to the broach positioner. NOTE This test also applies to machines with a vertical keyway.	
Diagram  	
Tolerance 0,030 / 300 (0,100 / 1 000) or 20“	
Measured deviation	
Measuring instruments Square and gauge blocks; or Square and dial gauge.	

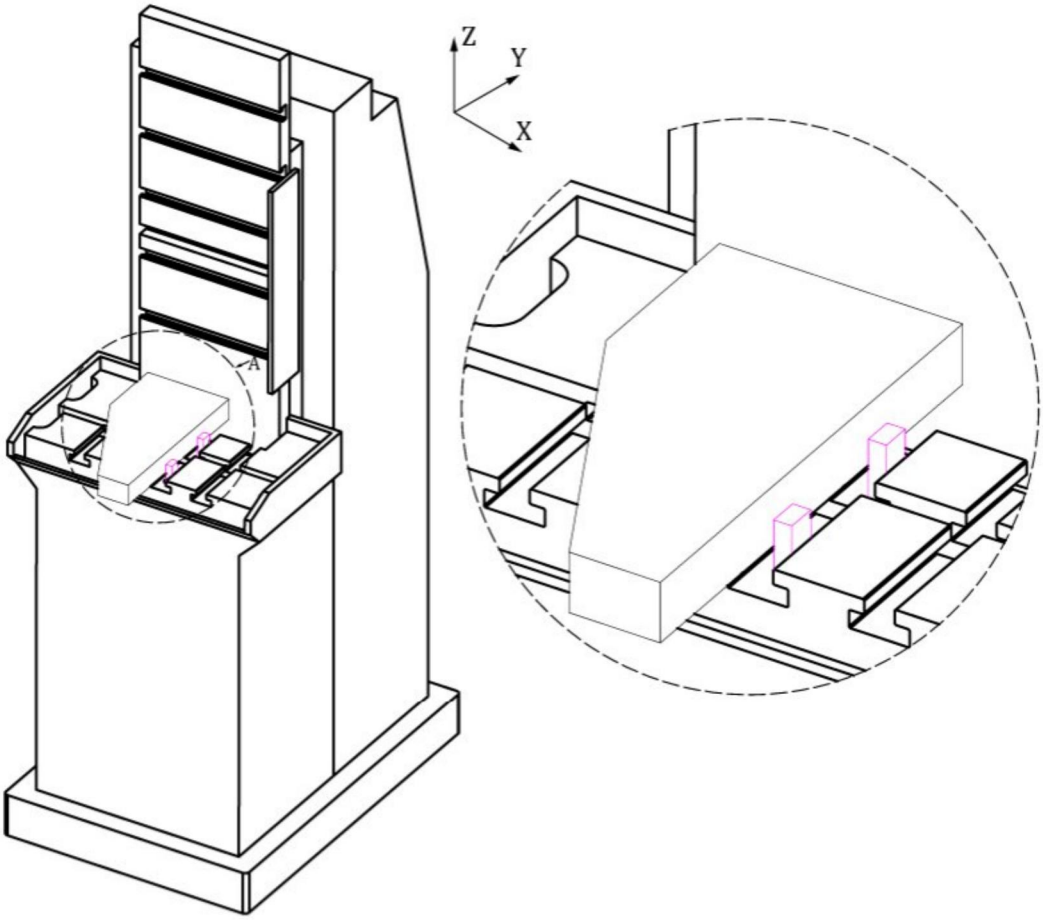
Observations and references to ISO 230-1:2012, 12.4.2

Fix one of measuring sides of the square to the broach positioner along Z direction. Insert gauge blocks between lower face of cross tenon and the other measuring side of the square along X direction at one end of the square. Repeat the same process for another end of the square by inserting gauge blocks. The squareness error is the difference between size of gauge blocks at two ends divided by the longitudinal distance between those locations.

Instead of using gauge blocks, a dial gauge can be moved along the broach positioner (along Z direction) or along the square (along X direction).

Object	**G7**
Checking of squareness of the table front-to-back slots to the broach holder.	

Diagram



Tolerance

0,025 over a measuring length of 300

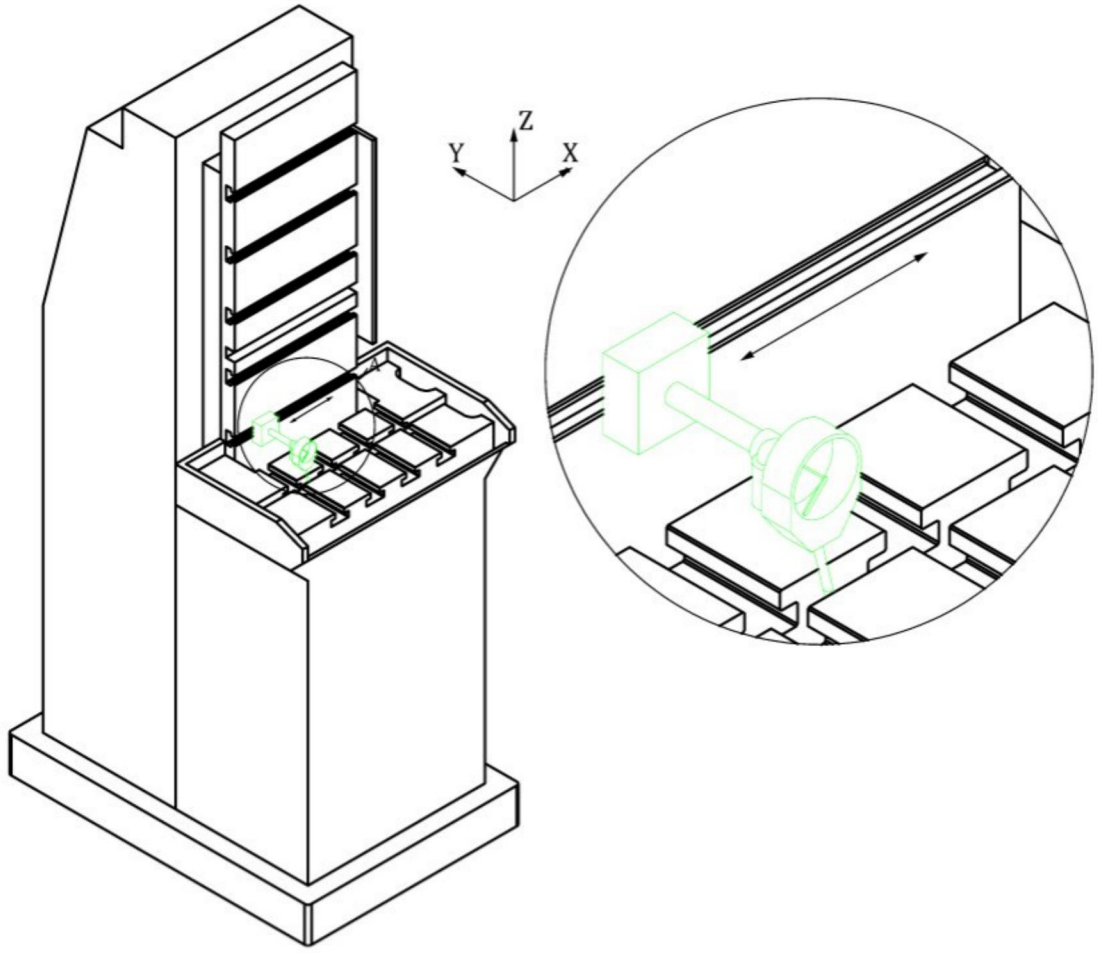
Measured deviation

Measuring instruments

Square and gauge blocks.

Observations and references to ISO 230-1:2012, 12.4.2

Fix one of measuring sides of the square to the broach holder along X direction. Insert gauge blocks between right face of the table slot and the other measuring side of the square along Y direction at one end of the square. Repeat the same process for another end of the square by inserting gauge blocks. The squareness error is the difference between the size of gauge blocks at two ends while the distance between two gauge blocks is set to 300.

Object	**G8**
Checking of parallelism of the table side-to-side slots to the broach holder.	
Diagram  	
Tolerance 0,025 on a measuring length of 300	
Measured deviation	
Measuring instruments Dial gauge; or Straightedge and gauge blocks.	
Observations and references to ISO 230-1:2012, 12.3.2.2 Contact the base of the dial gauge on the broach holder. Set its stylus touching front face of the table slot. Move the dial gauge base on the broach holder along X direction and record variations of the dial gauge. The parallelism error is the difference between maximum and minimum of readings of the dial gauge.	

7 Machining tests

Because of the diversity of shape of components produced by vertical surface type broaching machines, practical tests with determined shapes have not been introduced in this document. If the user requests